Claims 1-4, 6-8 and 10-16 were rejected under 35 USC 103(a) as being unpatentable over US Patent 4,250,519 (Mogi et al.) in view of US Patent 4,116,720 (Vinson). Dependent Claim 5 was rejected as being unpatentable over Mogi and Vinson and further in view of US Patent 5,025,293 (Seki) and dependent Claim 9 was rejected as being unpatentable over Mogi and Vinson and further in view of Wolf et al. (ISBN 0-9616721-6-1). Each of the outstanding rejections is respectfully traversed and reconsideration is requested.

Independent Claims

Independent Claim 1 is directed to a trench MOSFET transistor device having a drain region of a first conductivity type, a body region of a second conductivity type provided over the drain region, the drain region and said body region forming a first junction, a source region of the first conductivity type provided over the body region, the source region and body region forming a second junction, source metal disposed on an upper surface of the source region, a trench extending through the source region, body region and into the drain region and a gate region with an insulating layer lining at least a portion of the trench and a conductive region within the trench adjacent the insulating layer. The body region is separated from the source metal, and a doping profile along a line normal to upper and lower surfaces of the device is such that, within the body region and within at least a portion of the source and drain regions, the doping profile on one side of a centerplane of the body region is symmetric with the doping profile on an opposite side of the centerplane.

Independent Claim 14 is similar to independent Claim 1 but additionally recites that the drain and source regions are silicon of N-type conductivity, the body region is silicon of P-type conductivity, and the gate region has a silicon dioxide layer lining at least a portion of the trench and a doped polycrystalline silicon region within the trench adjacent the silicon dioxide layer. In addition, Claim 14 recites that the body region is separated from the source metal by the source region, the source and drain regions having the same doping material and peak net doping concentrations that are greater than a peak net doping concentration of the body region.

Claim Rejections

The Office Action takes the position (para.2) that Mogi teaches each of the elements recited in Claim 1 but does "not necessarily teach the further limitation defined ad (b) in claim 1 of Applicants" and takes the position that "for the purpose of retaining electrical symmetry...Vinson teaches...the doping profile on one side of a center plane of the body region is symmetric with the doping profile on an opposite side of the center plane" and that it would be "obvious...to modify the invention by Mogi so as to include aspect ad (b) as taught by Vinson"..

In fact, Applicants submit that Mogi fails to even teach or suggest the elements allegedly shown therein and, in addition, neither of the cited references teach or suggest combining the references in the manner suggested.

Independent Claim 1 recites (in addition to further limitations noted above):

(1) a drain region of a first conductivity type;

(2) a body region...provided over said drain region...;

(3) a source region...provided over said body region...;

(4) source metal disposed on an upper surface of said source region;

(5) a trench extending through said source region, through said body region and into said drain region; and

(6) a gate region comprising an insulating layer lining at least a portion of said trench and a conductive region within said trench adjacent said insulating layer.

First, the Action states that Mogi teaches "a drain region 27", "a body region 26...provided over said drain region...". Applicants respectfully submit that "lightly doped p-type silicon epitaxial layer 26" simply is *not* "provided *over* drain region 27 as Applicants' Claim 1 (element (2) above) requires. Rather, the only layer that is, in fact, *over* n+ type region 27, is "thick silicon dioxide layer 31".

Second, the Action relies upon region 24 (heavily doped n+ type buried layer – col. 2, lines 66-67) as teaching Applicants' recited "source region". In fact, Applicants recited source region is "provided *over said body region*" (see element (3) above)). Region 24 of Mogi is *not* "over" alleged "body region 26" of Mogi. Rather, layer 24 is "simultaneously formed in a surface portion of the substrate 21 and in the p+ type buried layer 22" (col. 2, line 67 – col. 3, line 1).

Third, the Action relies upon "conductive layer 34 serving as a drain electrode" as teaching Applicants' recited "source metal disposed on an upper surface of said source region". Clearly from observation of Figure 3 of Mogi, drain electrode 34 is *not disposed on an upper surface of layer 24*". Conductive layer 34 of Mogi does not touch an upper surface of buried layer 24.

Finally, the Action takes the position that the "V-groove" of Mogi teaches Applicants recited "trench extending through said source region, through said body region and into said drain region". In fact, the "bottom portions of" Mogi's V-groove merely "*reach into* the n+ type buried layers 23, 24 and 25 in the substrate 21" (col. 3, lines 11-12). Therefore the V-groove does not *extend "through"* the alleged "source region 24" of Mogi's device.

As discussed above, independent Claim 14 is similar to independent Claim 1 but recites additional limitations- for example, the conductivity type of the drain, source and body regions, and the gate region having a silicon dioxide layer lining at least a portion of the trench and a doped polycrystalline silicon region within the trench adjacent the silicon dioxide layer. Claim 14 is believed patentable over the cited art for all of the same reasons noted above with regard to Claim 1 and as reciting further limitations that are distinguishable over the cited art.

Accordingly, for all of the foregoing reasons, Applicants respectfully submit that neither of the cited references, taken separately or in any permissible combination, teach or suggest the elements recited in pending Claims 1-16.

It is respectfully submitted that in regard to the above amendment and remarks that the pending application is patentable over the art of record and prompt review and issuance is accordingly requested. Should the Examiner be of the view that an interview would expedite consideration of this response or of the application at large, request is made that the Examiner telephone the Applicant's undersigned attorney at (908) 518-7700 in order that any outstanding issues be resolved.

Respectfully submitted,

Karin L. Williams Registration No. 36,721

CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that this document and any document referenced herein has been transmitted via facsimile to the US Patent and Tradenark Office at (703) 872-9319 on May 20, 2002.

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